Time-dependent DMRG study of orbital-degenerate Hubbard model(New Development of Numerical Simulations in Low-Dimensional Quantum Systems: From Density Matrix Renormalization Group to Tensor Network Formulations)

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We have studied the real-time evolution of wavepackets that carry a holon-doublon pair in a one-dimensional e_g-orbital Hubbard model at quarter filling, by exploiting a time-dependent density-matrix renormalization group method [1]. Assuming that we have e_g orbitals on each site of a one-dimensional chain along the z direction, in the ground state, electrons are preferably accommodated in itinerant $d_{3z^2-r^2}$ orbitals to gain kinetic energy. Creating a holon-doublon pair into the ground state, we observe that wavepackets of holon and doublon propagate with its own individual velocity. The different velocity of holon and doublon propagation is caused by a pair-hopping process in the local Coulomb interaction. We will discuss a crucial role of the pair-hopping interaction in the charge dynamics.

References

[1] H. Onishi, J. Phys.: Conf. Ser. **200**, 012152 (2010).